Fiscal Federalism, Monopsony, and Public Goods Provision

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Abstract

In a standard model of fiscal federalism with tax competition, centralization unambiguously increases the supply of public goods. This result rests on the assumption that both local and central governments are price takers in the market for public goods; when the central government can exert influence over the price of the public goods, it may demand less. This paper allows the central government to be a monopsonist in the market for public goods inputs, showing that, with monopsony power, centralization may decrease public goods provision, depending on functional forms.

Keywords: fiscal federalism, public goods, monopsony, tax competition.

1 Introduction

Federalism, the division of responsibilities between multiple levels of government, is an important feature of modern economies. For example, citizens of the United States or the European Union receive public services from at least three levels of government; the U.S. alone comprises one central government, fifty states, and thousands of local governments. The diverse possibilities for the provision of public goods and services has been a wellspring of questions for public economists. Decentralization and centralization exhibit multiple distinct features, each with a potentially different implication for public goods provision.

In his seminal book, Oates (1972) noted that a key disadvantage of centralization is the uniform nature of central policy, while some possible downsides of decentralization might consist of externalities or increased costs of decision making. Subsequently, papers by Besley and Coate (2003) and Lockwood (2002) emphasized political economy frictions as important sources of suboptimality for central policy makers. In these papers, the central government is constrained by political forces, whether they involve an aversion to heterogeneous policy or the power of a majority vote.

This paper analyzes the provision of public goods when the distinguishing feature of the central government is economic rather than political. Specifically, I consider a setting in which the central government exercises market power when purchasing inputs for public goods, allowing the central government monopsony power on the inputs market. Monopsony power on the part of the central government dampens its incentives to provide the public good, because in decreasing provision it can lower the price it pays for every unit. I contrast a central government monopsonist with provision by decentralized tax competitors and show that, contrary to the price-taking case, centralization may actually decrease public goods provision in some cases.

The tax competition model I use to highlight this result is the capital tax competition model of Zodrow and Mieszkowski (1986) and Wilson (1986). In the standard case, both local and central governments are price takers; i.e., the supply curve is perfectly elastic and

fixed at a certain price from their perspective. Centralization in the standard case eliminates the downward pressure on taxes and spending of tax competition, shifting the demand curve for public goods to the right and increasing the provision of public goods relative to the decentralized case. In the monopsony case, the supply curve for public goods inputs slopes upward, and the central government can influence the price by its quantity decisions. In this case, I show that centralization involves trade-off between elimination of tax competition and the inefficiencies of monopsony. Whether centralization increases public goods provision in this case is impossible to determine; it is possible that monopsony power erases entirely the positive effects from eliminating tax competition.

The effect of tax competition on the level of public goods provision has been well covered in the literature. Notably, Hoyt (1991) presents a model of tax competition in which a decrease in the number of districts unambiguously increases the level of public goods provision. Wilson (1999) summarizes various models of tax competition, emphasizing that tax competition tends to encourage underprovision public goods relative to centralization. This paper confirms the dampening effect of tax competition on public goods provision, but notes that centralization may also tend to underprovide if it can exert market power in the market for the public goods inputs. This trade-off analysis mirrors the spirit of Brueckner (2004), which pits the "good side" of decentralization, Tiebout sorting, against the "bad side," tax competition.

In the next section, I review the baseline model of tax competition. Section 3 shows that centralization increases public goods provision in the price-taking, elastic supply case. In Section 4 I show that monopsony power dampens this result, and may overturn it completely. Section 5 considers the case in which the suppliers are citizens of the central government, and upholds the main result. Section 6 concludes.

2 Baseline model of tax competition

In order to study the effects of monopsony power on public goods provision, I study the baseline tax competition model of Zodrow and Mieszkowski (1986) and Wilson (1986) (the ZMW model, hereafter). I focus on the version of the model presented in Keen and Konrad (2013), following their notation and exposition closely, with some slight modifications. The model features multiple regions, each of which is endowed with immobile labor and perfectly mobile capital. Tax competition, therefore, arises from the movement of capital away from relatively high-tax regions to relatively low-tax areas until returns to capital are equalized. Formal characterization of the model is given below.

The economy is populated by n regions, $i = 1, ..., n$, each of which is endowed with amount of labor h_i. The capital-labor ratio employed in production in region i is denoted by k_i, and the output-labor ratio $f(k_i)$ is produced according to the production function f[1], which exhibits the standard behavior $f' > 0$ and $f'' < 0$. The representative household in each region is endowed with an amount of capital $\bar{k_i}$, and may invest its capital in any of the n regions, earning capital income for the regions in which it invests.

The government levies a unit tax $t_i \in [0, 1]$ on capital in each region, such that its revenue collected from region i is given by $t_i k_i$. Capital is paid its marginal product $f'(k_i)$ in each region; therefore, the after-tax return to capital in region i is given by $f'(k_i) - t_i$. Since capital is perfectly mobile, it must be that the return to capital must be the same in every region:

$$f'(k_i) - t_i = \rho \ \forall \ i \in 1, ..., n. \tag{1}$$

As a result, the income from the endowment of capital is given by $\rho\bar{k_i}$. Additionally, the income from the firm $f(k_i) - f'(k_i)k_i$ is transferred as income to the household in region i.

[1]Keen and Konrad (2013) allow for the possibility of heterogeneity in this function such that it would be denoted by f_i. This distinction is not important for the present analysis, so I make the assumption that production functions are equal for simplicity of exposition.

Welfare for the representative consumer in each region is given by

$$W_i(x_i, g_i) = x_i + G(g_i), \tag{2}$$

where x represents the numeraire consumption good, and g is the quantity of inputs to the public good, purchased at price p[2]. The function G satisfies $G' > 0$, $G'' < 0$, and represents the amount of utility generated by a level of public goods inputs g. G can be interpreted as a production function for final public goods, a utility function over public goods, or a combination of the two. Either interpretation is appropriate so long as concavity is ultimately satisfied. Combining the sources of income for the household and the government's budget condition $pg_i = t_i k_i$ yields the equation

$$W_i(x_i, g_i) = f(k_i) - f'(k_i)k_i + \rho\bar{k_i} + G\Big(\frac{t_i k_i}{p}\Big). \tag{3}$$

Combining endowments, equation 1, and the market clearing condition

$$\sum_{i=1}^{n} \sigma_i k_i = \sum_{i=1}^{n} \sigma_i \bar{k_i} = \bar{k} \tag{4}$$

where $\sigma_i \equiv h_i / \sum_{s=1}^{n} h_s$ represents the region's relative size, yields the equilibrium of the model. Given the tax rates in each of the n regions, an equilibrium is characterized by quantities k_i and return to capital ρ as functions $k_i(t_1, ..., t_n)$ and $\rho(t_1, ..., t_n)$ of the unit tax rates. Keen and Konrad (2013) show that the derivatives of the quantities with respect to the tax rates are given as follows:

$$\frac{\delta k_i}{\delta t_j} = \begin{cases} \frac{1}{f''}\Big(\frac{\sum_{s\neq i}\sigma_s/f''}{\sum_{s=1}^{n}\sigma_s/f''}\Big) < 0, & i = j \\ -\frac{1}{\sigma_i}\Big(\frac{(\sigma_i/f'')(\sigma_j/f'')}{\sum_{s=1}^{n}\sigma_s/f''}\Big) < 0, & i \neq j \end{cases}. \tag{5}$$

Given these derivatives, it is straightforward to show that the derivative of the return to

[2]I include the price of the public good input explicitly due to its key role in the analysis of market structures below.

capital with respect to any tax rate is

$$\frac{\delta \rho}{\delta t_j} = f'' \frac{\delta k_i}{\delta t_j}, j \neq i. \tag{6}$$

In the pursuit of simplicity, for the remainder of the paper I assume that regions are identical with respect to population and capital allocations: $\bar{k_i} = \bar{k} \; \forall \; 1, ..., n$. Identical population for each region yields $\sigma_i = \frac{1}{n} \forall i$. This simplification (along with the assumption of a symmetric policy equilibrium) yields the following derivatives with respect to the tax rates t_i:

$$\frac{\delta k_i}{\delta t_i} = \frac{n-1}{n} f''(\bar{k}) \tag{7}$$

$$\frac{\delta \rho}{\delta t_i} = \Big(\frac{n-1}{n}\Big)^2 \Big(f''(\bar{k})\Big)^2 - 1. \tag{8}$$

Armed with these equilibrium conditions, we can now examine the tax and spending decisions of welfare-maximizing governments under decentralization and centralization, respectively.

3 Perfectly elastic supply: centralization increases provision

First consider the case of perfectly elastic supply, in which the price p of the public good input is taken as fixed by whichever government provides it. This is the case implicit in many models of public goods provision, which often do not explicitly model the supply side of public goods inputs. An example to keep in mind might be that of a state or local government buying asphalt to fix the roads; such a government is not likely to have influence over the world price of asphalt. The comparison of local vs central provision, then, could yield an interpretation in which a U.S. state, say Michigan, is the 'central' governmental unit and Michigan's cities and townships are the 'local' units. A comparison in the context of the ZMW model shows that centralizing the provision of such a public good will increase the level of provision of the good.

3.1 Decentralized case

The local government in locality i chooses a unit tax t_i in order to maximize welfare W_i, given the endowments and the tax profile of the other $n-1$ localities:

$$max_{t_i} f(k_i) - f'(k_i)k_i + \rho\bar{k} + G\Big(\frac{t_i k_i}{p}\Big). \tag{9}$$

The first order condition with respect to t_i is

$$f'(k_i)\frac{\delta k_i}{\delta t_i} - f'(k_i)\frac{\delta k_i}{\delta t_i} - f''(k_i)\frac{\delta k_i}{\delta t_i}k_i + \frac{\delta \rho}{\delta t_i}\bar{k} + G'\Big(\frac{t_i k_i}{p}\Big)\frac{\frac{\delta k_i}{\delta t_i}t_i + k_i}{p} = 0. \tag{10}$$

The key feature of the decentralized case is the presence of tax competition, as it is indeed the canonical ZMW model. The local governments must take into account that a tax change will chase capital away; additionally, taxes will have an ambiguous effect on the return to capital ρ, depending on the curvature of the production function.

Continuing with the assumption that $\bar{k_i} = \bar{k}$ for all identically sized local regions, a symmetric policy equilibrium means the derivatives $\frac{\delta k_i}{\delta t_i}$ and $\frac{\delta \rho}{\delta t_i}$ are given by Equations 7 and 8, respectively. Plugging in to the first order condition above, the policy is given by a t_i which satisfies

$$-\frac{n-1}{n}(f''(\bar{k}))^2\bar{k} + \frac{n-1}{n}(f''(\bar{k}))^2\bar{k} - \bar{k} + G'\Big(\frac{t_i\bar{k}}{p}\Big)\left(\frac{\frac{n-1}{n}f''(\bar{k})t_i + \bar{k}}{p}\right) = 0. \tag{11}$$

The local government's demand curve for the public good input is given by recognizing $t_i = \frac{g^l p}{\bar{k}}$, where g^l is the level of public good inputs per-person demanded by local governments. The demand equation is given by

$$G'(g^l) = p * \left(\frac{\bar{k}}{\bar{k} + g^l\frac{p}{\bar{k}}\big(\frac{n-1}{n}\big)f''(\bar{k})}\right). \tag{12}$$

3.2 Centralized case

The central government maximizes the same welfare function as the local governments. Given that there is no *ex ante* uniformity restriction on the tax rates, the central government faces the same series of first order conditions faced by the local governments. However, the identical nature of the localities will cause the central government to simply search for a single tax rate t which applies to all capital.[3]

The central government, therefore, is not subject to the pressures of tax competition; because it chooses a single tax rate for all regions, it faces the derivatives

$$\frac{\delta k_i}{\delta t} = 0$$

and

$$\frac{\delta \rho}{\delta t} = -1.$$

The resulting first order condition for the central government is then

$$-\bar{k} + G'\left(\frac{t\bar{k}}{p}\right)\frac{\bar{k}}{p}. \tag{13}$$

Plugging in for centralized public goods purchases per person g^c and simplifying, the familiar result

$$G'(g^c) = p \tag{14}$$

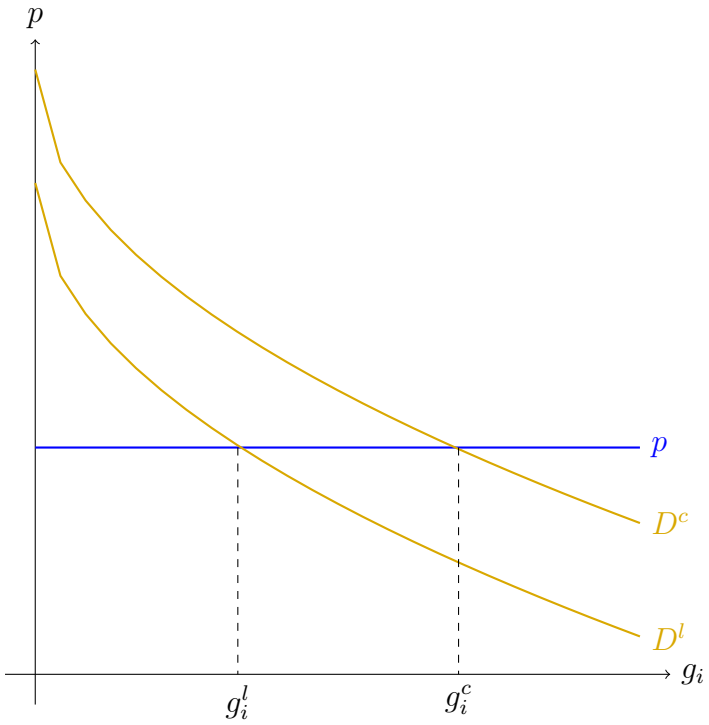
describes the demand curve.

3.3 Comparison

Each case under consideration results in a demand function; these functions are given by Equations 12 and 14 for the decentralized and centralized cases, respectively. Whether

[3]Alternatively, one could impose the uniformity of the policy as a constraint on the central government, as in Oates (1972). The distinction is unimportant in the symmetric case presented here.

Figure 1: Perfectly elastic supply



centralization or decentralization results in higher demand for public goods depends on a comparison between these two equations. For example, if $\left(\frac{\bar{k}}{\bar{k}+g^l\frac{p}{k}\left(\frac{n-1}{n}\right)f''(\bar{k})}\right)$ is always greater than or less then 1, then we can be certain about the relative positions of demand at every price.

Note first that $f'' < 0$ by assumption. Since g, p, $\bar{k}$, and n are positive, is must be that $g^l\frac{p}{k}\left(\frac{n-1}{n}\right)f''(\bar{k}) < 0$ everywhere. It follows that, for every price p, $\left(\frac{\bar{k}}{\bar{k}+g^l\frac{p}{k}\left(\frac{n-1}{n}\right)f''(\bar{k})}\right) > 1$, and $G'(g^l(p)) > G'(g^c(p))$. Since $G'' < 0$ by assumption, this implies that $g^l(p) < g^c(p)$ for all positive values of p. In words, centralized provision of public goods produces a demand curve for public goods inputs which is shifted to the right relative to decentralized provision, resulting in a higher level of public goods provision. This result is illustrated in Figure 1, where D^l and D^c represent the demand curves arising from the decentralized and centralized cases, respectively.

4 Monopsony power: ambiguous effect of centralization

Now suppose that, instead of being a small player in the market for the public good input, the central government is the world's *only* buyer of that input. For example, suppose the geography of the economy in question requires roads to be a specific type of asphalt not used anywhere else. This is of course an extreme case, but it serves to illustrate the effects of bargaining power. In this case, the central government will not be a price taker; rather, it will be able to exert full monopsony power on the market for the public good input.

Analysis of this monopsony case will proceed much like the elastic supply case, but with a couple of minor tweaks. First, assume n is large enough that, in the case of decentralized provision, no individual region may exert influence over the price. As a simplifying limiting case, we may take $n \to \infty$. Furthermore, the supply side of this environment must be modeled explicitly. Included in this section is a supply curve $p = p(g)$, where $p' > 0$. For now, the governments do not care about the welfare of the supplier, the implicit assumption being that the suppliers are not residents of the economy, despite being dependent on its market for these public goods inputs.

4.1 Decentralized case

The demand curve which arises in the case of monopsony is essentially the same as that in the case of perfect elasticity, as regional governments still solve the maximization problem as price takers. Taking the limit $n \to \infty$ yields the demand equation

$$G'(g^l) = p * \left(\frac{\bar{k}}{\bar{k} + g^l \frac{p}{\bar{k}} f''(\bar{k})} \right). \tag{15}$$

The equilibrium quantity g^l then, is not determined by the exogenous price, but by the intersection of this demand curve with the supply curve $p(g)$:

$$G'(g^l) = p(g^l) * \left(\frac{\bar{k}}{\bar{k} + g^l \frac{p(g^l)}{\bar{k}} f''(\bar{k})} \right). \tag{16}$$

The quantity g^l which solves this equation is the equilibrium quantity of public goods per capita provided by local governments in the decentralized case.

4.2 Centralized case

While the decentralized demand curve closely mirrors that in the perfectly elastic case, the problem of the central government is quite different. Given that the central government is the only buyer in the market for the public good input g, it exerts full monopsony power over the price. This monopsony power means that it must fully internalize the effects of its quantity decisions on the price of each unit it purchases. An extra unit purchased increases the total expenditure of the central government by more than the price, since it also has a marginal effect on the price of all units.

To analyze this problem, it is helpful to recognize $t = gp(g)/\bar{k}$ and substitute in to the government's problem as one of directly choosing g:

$$max_g f(k_i) - f'(k_i)k_i + \rho\bar{k} + G\big(g\big), \tag{17}$$

where $\rho = f'(k_i) - \frac{gp(g)}{k_i}$. Symmetry of regions yields $k_i = \bar{k}$ as before, so the first order condition of the central government with respect to g is:

$$-\frac{1}{\bar{k}}\Big(p(g) + g\frac{dp}{dg}\Big) + G'(g) = 0. \tag{18}$$

The quantity of public goods inputs purchased in the centralized case, then, is given by the

solution to the equation

$$G'(g^m) = \frac{1}{\bar{k}}\big(p(g^m) + g^m p'(g^m)\big). \tag{19}$$

Note that this equation is similar to Equation 14 in the perfectly elastic case, with a supply curve plugged in for p and an extra term describing the marginal expenditure induced on all purchases. By construction, g and p' are positive, and so at the same price the monopsony case will produce a lower level of centralized provision than the price-taking case. But will this dampening effect of monopsony power cause centralization to provide an even lower amount of public goods than decentralization?

4.3 Comparison

In the case where the central government exerts monopsony power in the market for public goods, there are two opposing forces affecting whether centralization increases or decreases public goods provision. The first is the familiar presence of tax competition, which is the only force in the baseline ZMW framework. Centralization eliminates tax competition incentives, which tend to decrease the government's demand for public goods; therefore, the elimination of tax competition through centralization is a positive force on the level of public goods provision.

The second force at work in the monopsony case is the bargaining power that the central government is able to exert on the suppliers of the public good input. The marginal impact on total expenditure of an extra unit of public goods is higher than the price of the extra unit, because the price increases for every unit being purchased. Because local governments are not able to exert influence on the price, this monopsony power has a dampening effect on public goods provision under centralization relative to decentralization. The relative sizes of these two forces, tax competition and monopsony, will determine whether centralization or decentralization provides a higher level of the public good.

To compare decentralization and centralization, we must return to the two equations determining the equilibrium quantity of public goods under the two cases. Again, the

equations determining g^l and g^m, the decentralized and centralized provisions with a central monopsony, are given by

$$G'(g^l) = p(g^l) * \left(\frac{\bar{k}}{\bar{k} + g^l \frac{p(g^l)}{\bar{k}} f''(\bar{k})} \right),$$

$$G'(g^m) = \frac{1}{\bar{k}} \big(p(g^m) + g^m p'(g^m) \big).$$

Here, it is impossible to say whether g^l or g^m will be greater. The functional forms of $f(.)$, $G(.)$, and $p(.)$ will determine the relative strengths of the tax competition and monopsony forces discussed above.

Figures 2 and 3 illustrate two different cases which could result from this model, depending on functional forms. The local provision of public goods g^l is determined by an intersection point with the supply curve. The centralized level g^m, however, is determined by the intersection of the demand curve not with the supply curve but with the 'marginal expenditure' curve ME, which reflects the effect of the central government's demand on the price of the public good input. When the gap between demand curves (tax competition) is large relative to the gap between $p(g)$ and $ME(g)$ (monopsony power), then centralization increases public goods provision. When tax competition is relatively small and monopsony power is large, the effect is reversed, and decentralization provides more public goods. To show this in a clear way, I present below a simple example to shed light on the fact that the result could go either way.

Figure 2: Monopsony case 1: centralization increases provision

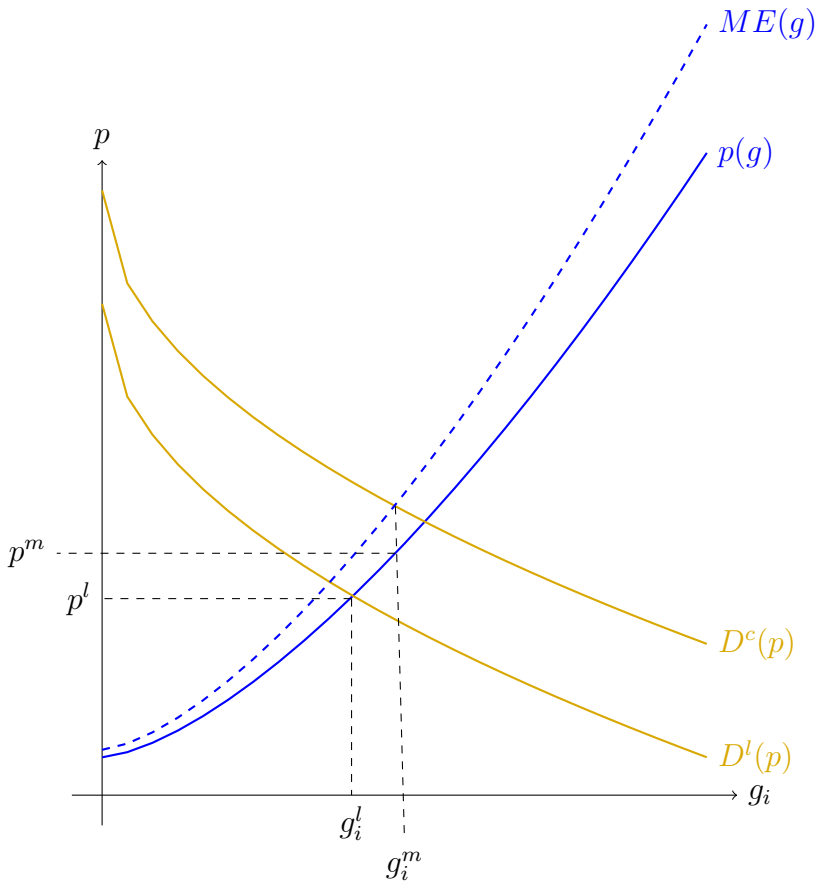
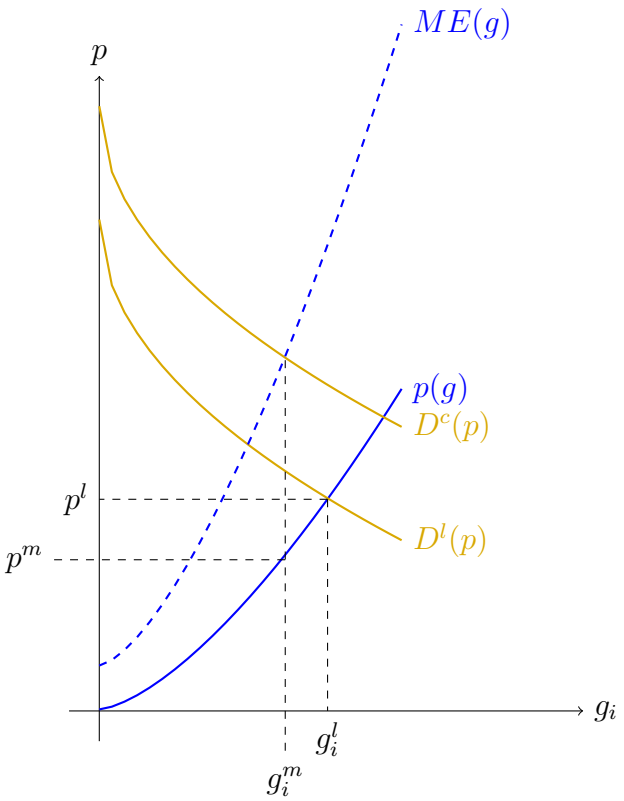


Figure 3: Monopsony case 2: centralization decreases provision



4.4 A simple example

Consider the simple example of the tax competition model with monopsony at the central level and the following functional forms: $G'(g) = \frac{1}{g}$, $p(g) = Pg$, $f''(k) = A < 0$, $\bar{k} = 1$, and $n \to \infty$. Plugging in and solving Equations 16 and 19 results in the following equilibrium quantities for public goods inputs:

$$g^l = \big((1-A)P\big)^{-1/2}$$

$$g^m = (2P)^{-1/2}.$$

In this case, whether centralization increases public goods provision clearly depends on A, the second derivative of the production function:

$$|A| > 1 \Rightarrow g^l < g^m$$

$$|A| = 1 \Rightarrow g^l = g^m$$

$$|A| < 1 \Rightarrow g^l > g^m.$$

The intuition behind this result is clear: the shape of the production function determines the amount of tax competition in the economy. When the production function is relatively concave, tax competition under decentralization is high, and centralization results in higher public goods spending. Alternatively, when the production function is relatively flat, tax competition is less important; in this case, the monopsony force overpowers the elimination of tax competition and centralization decreases spending on public goods.

5 Welfare of the supplier

One assumption implicit in the preceding analysis is the presence of an *outside* supplier. Admittedly, this is a somewhat strange thought experiment: the central government is the only buyer in a market, but none of the suppliers exist under its jurisdiction. The example would be a U.S. state that requires a unique type of asphalt used nowhere else, but manufactured in China.

A more realistic setting would be one in which the public goods inputs are supplied from within the region itself. In this case, however, a benevolent government should care about the suppliers; it may not wish to extract as much surplus from them via its monopsony power as it would for outside suppliers it didn't care about. The example in mind here might be public school teachers; the government's desire to economize will be offset somewhat by its desire to pay its teachers (citizen-suppliers) well.

The main difference from the baseline in this case is that each level of government now cares about maximizing the surplus that its constituents receive from supplying the public good input. For simplicity, I continue to abstract from the microfoundations of the supply function $p(g)$. One might imagine, of course, that $p(g)$ arises from some familiar household labor decision or some individual production technology involving labor. For now, however, I decline to take a stand on the exact nature of the household supply decisions, recognizing that all the relevant information is contained in the producer surplus calculation.

5.1 Decentralized case

Consider the decentralized case in which there is a continuum of local governments. Here, suppose the citizens in each locality participate in the market for the public good input for the entire economy; this preserves the assumption that the local government is a price taker with respect to the public good input. Furthermore, the local government can't have an effect on the producer surplus of its representative citizen, since this surplus depends on the total demand for the public good. Therefore, the equation determining the quantity of public goods in the decentralized case is exactly as before:

$$G'(g^l) = p(g^l) * \left(\frac{\bar{k}}{\bar{k} + g^l \frac{p(g^l)}{\bar{k}} f''(\bar{k})} \right). \tag{20}$$

5.2 Centralized case

The centralized case, then, is the case in which the location of the suppliers within the region is of consequence. Now, in addition to its ability to exert influence on the price, the central government also takes into account its effect on the producer surplus of the representative consumer. As before, all localities are identical. The central government solves the following maximization problem:

$$max_g f(k_i) - f'(k_i)k_i + \rho\bar{k} + G\big(g\big) + \int_0^g \big[p(g) - p(s)\big]ds, \tag{21}$$

where the final term is the producer surplus accrued by the suppliers, which the government now cares about.

The first order condition with respect to public goods of this maximization problem is similar to the previous case, with the added marginal change in producer surplus:

$$\frac{-\big(p(g)+gp'(g)\big)}{\bar{k}} + G'(g) + \frac{\delta}{\delta g}\left(\int_0^g \big[p(g)-p(s)\big]ds\right) = 0.$$

By Leibniz rule, this becomes

$$\frac{-\big(p(g)+gp'(g)\big)}{\bar{k}} + G'(g) + \big(p(g)-p(g)\big) * 1 - \big(p(g)-p(0)\big) * 0 + \int_0^g p'(g)ds = 0$$

$$\frac{-\big(p(g)+gp'(g)\big)}{\bar{k}} + G'(g) + \int_0^g p'(g)ds = 0$$

$$\frac{-\big(p(g)+gp'(g)\big)}{\bar{k}} + G'(g) + p'(g)g = 0.$$

This, then, yields the equilibrium condition for the quantity of public goods in the centralized case:

$$G'(g^m) = \frac{p(g^m)}{\bar{k}} + \left(\frac{1}{\bar{k}} - 1\right)p'(g^m)g^m. \tag{22}$$

This equation is similar to the previous Equation 19, with an added term $-p'(g^m)g^m$, representing the fact that the central government's desire to achieve a lower price is mitigated by its desire to increase producer surplus for its citizens. Given that $p'(g^m) > 0$ and $g^m > 0$, this is an unambiguously positive effect on the supply of public goods compared to the case in which the suppliers are not citizens. Does it, however, eliminate the possibility that decentralization might increase public goods provision?

5.3 Comparison

Consider now the equations governing public goods provision when producers are citizens, i.e., the central government cares about producer surplus:

$$G'(g^l) = p(g^l) * \left(\frac{\bar{k}}{\bar{k} + g^l \frac{p(g^l)}{\bar{k}} f''(\bar{k})} \right)$$

$$G'(g^m) = \frac{p(g^m)}{\bar{k}} + \left(\frac{1}{\bar{k}} - 1 \right) p'(g^m) g^m.$$

Once again, it is impossible to say which case will generate a higher provision of public goods. Returning to the above simple example and eliminating the $\bar{k} = 1$ assumption yields the following conditions:

$$g^l = \left(P\left(1 - \frac{A}{\bar{k}}\right) \right)^{-1/2}$$

$$g^m = \left(P\left(\frac{2}{\bar{k}} - 1\right) \right)^{-1/2}.$$

Here, whether or not centralization increases provision of public goods depends on both the second derivative of the production function A and the per-capita endowment of capital $\bar{k}$:

$$\frac{2}{\bar{k}} + \frac{A}{\bar{k}} < 2 \Rightarrow g^l < g^m$$

$$\frac{2}{\bar{k}} + \frac{A}{\bar{k}} = 2 \Rightarrow g^l = g^m$$

$$\frac{2}{\bar{k}} + \frac{A}{\bar{k}} > 2 \Rightarrow g^l > g^m.$$

While the monopsony effect is mitigated somewhat when producers are citizens (centralization always increases provision when $\bar{k} = 1$), this example demonstrates that it can still decrease public goods provision relative to decentralization in some cases.

6 Conclusion

This paper has shown that whether centralization increases or decreases public goods provision relative to decentralization in a model of tax competition might depend on the market power of the central government as a purchaser of public goods. When the central government is a price taker, centralization unambiguously increases provision. However, when the central government is a monopsonist buyer of public goods inputs, it may be that centralization actually decreases public goods provision; the strength of the dampening effect depends on model parameters.

Given the results put forth in this paper, policy makers might consider the degree to which different levels of government exert influence over the price of goods and services. For example, a U.S. state government might be a near-monopsonist buyer of educators located in the state, while local governments might search for teachers in a more competitive market. The difference in bargaining power between the two could be an important consideration in the debate about the degree of centralization of education.

Having introduced the idea of monopsony power in public goods markets, more research remains to be done in this area. First, it is unlikely that any government enjoys full monopsony power over a single input; it is more likely that governments differ in the degree to which price influence is exerted. More research is needed into the effect of incomplete market power on the demand side of public goods. Furthermore, I have abstracted from heterogeneity or the effect of monopsony in other models of federalism and public goods provision; work in these areas promises to yield insights into the potential effects of monopsony. In any event, this paper puts forth a potentially important source of deviation from the standard results on centralization, and adds another wrinkle into the complex study of fiscal federalism.

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